Claims:

1-14. (cancelled)

15. (currently amended) The method of claim ~~14~~ 24, said engine control parameters comprising at least two of engine rotational speed, engine load, vehicle acceleration, transmission gear ratio, throttle position, propeller pitch and fuel mixture.

16. (cancelled)

17. (currently amended) The method of claim ~~16~~ 24, wherein spark timing controlled sound signals are generated in response to said engine load and spark event outputs from said engine process model.

18. (currently amended) The method of claim ~~16~~ 24, wherein direct engine rotational speed sound signals are generated in response to said engine load and engine rotational speed outputs from said engine process model.

19. (original) The method of claim 18, wherein said direct engine rotational speed sound signals are generated by applying said engine load and engine rotational speed outputs to cross-fade loops.

20. (original) The method of claim 18, wherein said direct engine rotational speed sound signals are generated by applying said engine load and engine rotational speed outputs to a feedback FM block.

21. (currently amended) The method of claim ~~16~~ 24, wherein engine rotational speed related sound signals are generated in response to said engine load and engine rotational speed outputs from said engine process model.

22. (currently amended) The method of claim 21, wherein said engine rotational speed related sound signals comprise at ~~lest~~ least one of whistles, whines, engine roar, turbines and FM rumble.

23. (cancelled)

24. (previously presented) A method of synthesizing sound signals associated with a vehicle having an engine, comprising:

providing to an engine process model a plurality of engine control parameters which characterize respective engine control conditions, and

generating, in response to an output from said engine process model, engine related sound signals corresponding to said engine control parameters,

wherein the outputs from said engine process model comprise engine load, spark event and engine rotational speed signals, and said engine process model comprises an engine physical model which generates said spark event and engine rotational speed outputs, and a load behavior model which generates said engine load output,

said engine physical model comprising a starter motor model which provides an initial engine shaft rotational speed signal in response to an engine start control signal, an angular integrator which generates an engine shaft angle signal from said engine shaft rotational speed signal, and a spark timing model that generates

said spark event output to simulate the firing of sparks at multiple shaft angles in response to said engine shaft angle signal.

25. (original) The method of claim 24, said engine physical model further comprising a spark force-to-velocity converter that generates an engine shaft rotational speed signal corresponding to said spark event output, and a velocity regulator model that models engine rotational speed regulating factors and is connected to complete a feedback loop from the output of said spark force-to-velocity converter and the input to said angular interrogator.

26. (currently amended) The method of claim ~~14~~ 24, wherein the outputs from said engine process model comprise engine load and spark event signals which cooperate to generate at least one of engine resonance, air chop, one-shot sound file playback and exhaust system sound signals.

27. (original) The method of claim 26, wherein said engine load and spark event signals cooperate to generate an engine resonance sound signal, and said engine load signal and engine resonance sound signal cooperate to generate a turbulence sound signal.

28. (original) The method of claim 26, wherein said engine load and spark event signals are supplied to an exhaust system model that includes at least one of explosion spreading, turbulence and filtering resonance models to generate said exhaust system sound signal.

29. (previously presented) A method of synthesizing sound signals associated with a vehicle having an engine, comprising:

providing to an engine process model a plurality of engine control parameters which characterize respective engine control conditions, and

generating, in response to an output from said engine process model, engine related sound signals corresponding to said engine control parameters,

wherein the outputs from said engine process model comprise engine load and spark event signals which cooperate to generate at least one of engine resonance, air chop, one-shot sound file playback and exhaust system sound signals, and said engine load and spark event signals are supplied to an exhaust system model that includes at least one of explosion spreading, turbulence and filtering resonance models to generate said exhaust system sound signal, and

wherein said load and spark event signals are supplied to an explosion spreading model within said exhaust system model which simulates the spreading of the initial pressure wave of an ignition explosion, and only said load signal is supplied to a turbulence model that simulates constrictions and/or bends in an exhaust system waveguide, and a filtering resonance model that simulates an exhaust muffler, the output of said explosion spreading model providing an input to said turbulence model, the output of said turbulence model providing an input to said filtering resonance model, and the output from said filtering resonance model providing said exhaust system sound signal.

30-43. (cancelled)

44. (currently amended) The apparatus of claim ~~43~~ 53, said engine control parameters comprising at least two of engine rotational speed, engine load, vehicle acceleration, transmission gear ratio, throttle position, propeller pitch and fuel mixture.

45. (cancelled)

46. (currently amended) The apparatus of claim ~~45~~ 53, wherein said engine related sound signal synthesizer generates spark timing controlled sound signals in response to said engine load and spark event outputs from said engine process model.

47. (currently amended) The apparatus of claim ~~45~~ 53, wherein said engine related sound signal synthesizer generates direct engine rotational speed sound signals in response to said engine load and engine rotational speed outputs from said engine process model.

48. (original) The apparatus of claim 47, wherein said engine related sound signal synthesizer generates said direct engine rotational speed sound signals by applying said engine load and engine rotational speed outputs to cross-fade loops.

49. (original) The apparatus of claim 47, wherein said engine related sound signal synthesizer generates said direct engine rotational speed sound signals by applying said engine load and engine rotational speed outputs to a feedback FM block.

50. (currently amended) The apparatus of claim ~~45~~ 53, wherein said engine related sound signal synthesizer generates engine rotational speed related sound signals in response to said engine load and engine rotational speed outputs from said engine process model.

51. (original) The apparatus of claim 50, wherein said engine rotational speed related sound signals comprise at least one of whistles, whines, engine roar, turbines and FM rumble.

52. (cancelled)

53. (previously presented) Apparatus for synthesizing sound signals associated with a vehicle having an engine, comprising:

an engine control input which provides a plurality of engine control parameters characterizing respective engine control conditions, and

an engine related sound synthesizer which generates engine related sound signals corresponding to said engine control parameters,

wherein said engine control input provides said engine control parameters to an engine process model, said engine related sound signal synthesizer generates said engine related sound signals in response to an output from said engine process model, the outputs from said engine process model comprise engine load, spark event and engine rotational speed signals, and said engine process model comprises an engine physical model which generates said spark event and engine rotational speed outputs, and a load behavior model which generates said engine load output,

said engine physical model comprising a starter motor model which provides an initial engine shaft rotational speed signal in response to an engine start control signal, an angular integrator which generates an engine shaft angle signal from said engine shaft rotational speed signal, and a spark timing model that generates said spark event output to simulate the firing of sparks at multiple shaft angles in response to said engine shaft angle signal.

54. (original) The apparatus of claim 53, said engine physical model further comprising a spark force-to-velocity converter that generates an engine shaft rotational speed signal corresponding to said spark event output, and a velocity regulator model that models engine rotational speed regulating factors and is connected to complete a feedback loop from the output of said spark force-to-velocity converter and the input to said angular integrator.

55. (currently amended) The apparatus of claim ~~43~~ 53, wherein the outputs from said engine process model comprise engine load and spark event signals which cooperate to generate at least one of engine resonance, air chop, one-shot sound file playback and exhaust system sound signals.

56. (original) The apparatus of claim 55, wherein said engine load and spark event signals cooperate to generate an engine resonance sound signal, and said engine load signal and engine resonance sound signal cooperate to generate a turbulence sound signal.

57. (original) The apparatus of claim 55, wherein said engine process model supplies said engine load and spark event signals to an exhaust system model that includes at least one of explosion spreading, turbulence and filtering resonance models to generate said exhaust system sound signal.

58. (previously presented) Apparatus for synthesizing sound signals associated with a vehicle having an engine, comprising:

an engine control input which provides a plurality of engine control parameters characterizing respective engine control conditions, and

an engine related sound synthesizer which generates engine relates sound signals corresponding to said engine control parameters,

wherein said engine control input provides said engine control parameters to an engine process model, said engine related sound signal synthesizer generates said engine relates sound signals in response to an output from said engine process model, the outputs from said engine process model comprise engine load and spark event signals which cooperate to generate at least one of engine resonance, air chop, one-shot sound file playback and exhaust system sound signals, said engine process model supplies said engine load and spark event signals to an exhaust system model that includes at least one of explosion spreading, turbulence and filtering resonance models to generate said exhaust system sound signal, and

wherein said engine process model supplies said load and spark event signals to an explosion spreading model within said exhaust system model which simulates the spreading of the initial pressure wave of an ignition ex-

plosion, and only said load signal to a turbulence model that simulates constrictions and/or bends in an exhaust system waveguide, further comprising a filtering resonance model that simulates an exhaust muffler, the output of said explosion spreading model providing an input to said turbulence model, the output of said turbulence model providing an input to said filtering resonance model, and the output from said filtering resonance model providing said exhaust system sound signal.

59. (new) The method of claim 29, said engine control parameters comprising at least two of engine rotational speed, engine load, vehicle acceleration, transmission gear ratio, throttle position, propeller pitch and fuel mixture.

60. (new) The method of claim 29, wherein the outputs from said engine process model comprise engine load, spark event and engine rotational speed signals.

61. (new) The method of claim 60, wherein spark timing controlled sound signals are generated in response to said engine load and spark event outputs from said engine process model.

62. (new) The method of claim 60, wherein direct engine rotational speed sound signals are generated in response to said engine load and engine rotational speed outputs from said engine process model.

63. (new) The method of claim 62, wherein said direct engine rotational speed sound signals are generated

by applying said engine load and engine rotational speed outputs to cross-fade loops.

64. (new) The method of claim 62, wherein said direct engine rotational speed sound signals are generated by applying said engine load and engine rotational speed outputs to a feedback FM block.

65. (new) The method of claim 60, wherein engine rotational speed related sound signals are generated in response to said engine load and engine rotational speed outputs from said engine process model.

66. (new) The method of claim 65, wherein said engine rotational speed related sound signals comprise at least one of whistles, whines, engine roar, turbines and FM rumble.

67. (new) The method of claim 60, wherein said engine process model comprises an engine physical model which generates said spark event and engine rotational speed outbursts, and a load behavior model which generates said engine load output.

68. (new) The method of claim 29, wherein the outputs from said engine process model comprise engine load and spark event signals which cooperate to generate at least one of engine resonance, air chop, one-shot sound file playback and exhaust system sound signals.

69. (new) The method of claim 68, wherein said engine load and spark event signals cooperate to generate an engine resonance sound signal, and said engine load

signal and engine resonance sound signal cooperate to generate a turbulence sound signal.

70. (new) The method of claim 68, wherein said engine load and spark event signals are supplied to an exhaust system model that includes at least one of explosion spreading, turbulence and filtering resonance models to generate said exhaust system sound signal.

71. (new) The apparatus of claim 58, said engine control parameters comprising at least two of engine rotational speed, engine load, vehicle acceleration, transmission gear ratio, throttle position, propeller pitch and fuel mixture.

72. (new) The apparatus of claim 58, wherein the outputs from said engine process model comprise engine load, spark event and engine rotational speed signals.

73. (new) The apparatus of claim 72, wherein said engine related sound signal synthesizer generates spark timing controlled sound signals in response to said engine load and spark event outputs from said engine process model.

74. (new) The apparatus of claim 72, wherein said engine related sound signal synthesizer generates direct engine rotational speed sound signals in response to said engine load and engine rotational speed outputs from said engine process model.

75. (new) The apparatus of claim 74, wherein said engine related sound signal synthesizer generates said

direct engine rotational speed sound signals by applying said engine load and engine rotational speed outputs to cross-fade loops.

76. (new) The apparatus of claim 74, wherein said engine related sound signal synthesizer generates said direct engine rotational speed sound signals by applying said engine load and engine rotational speed outputs to a feedback FM block.

77. (new) The apparatus of claim 72, wherein said engine related sound signal synthesizer generates engine rotational speed related sound signals in response to said engine load and engine rotational speed outputs from said engine process model.

78. (new) The apparatus of claim 77, wherein said engine rotational speed related sound signals comprise at least one of whistles, whines, engine roar, turbines and FM rumble.

79. (new) The apparatus of claim 72, wherein said engine process model comprises an engine physical model which generates said spark event and engine rotational speed outputs, and a load behavior model which generates said engine load output.

80. (new) The apparatus of claim 79, said engine physical model comprising a starter motor model which provides an initial engine shaft rotational speed signal in response to an engine start control signal, an angular integrator which generates an engine shaft angle signal from said engine shaft rotational speed signal, and a

spark timing model that generates said spark event output to simulate the firing of sparks at multiple shaft angles in response to said engine shaft angle signal.

81. (new) The apparatus of claim 80, said engine physical model further comprising a spark force-to-velocity converter that generates an engine shaft rotational speed signal corresponding to said spark event output, and a velocity regulator model that models engine rotational speed regulating factors and is connected to complete a feedback loop from the output of said spark force-to-velocity converter and the input to said angular integrator.

82. (new) The apparatus of claim 58, wherein said engine load and spark event signals cooperate to generate an engine resonance sound signal, and said engine load signal and engine resonance sound signal cooperate to generate a turbulence sound signal.